Overview

• WXXM / IWXXM Background and Status
• ICAO Meteorological Panel (MET/P)
  – Working Group for Meteorological Information Exchange (WG-MIE)
    • IWXXM/SWIM Implementation Focus
• FAA NextGen Wx Programs
  – NextGen Weather Processor (NWP)
  – Common Support Services-Weather (CSS-Wx)
Wx Data Models

Data Model Component Agility

- High (months)
  - EU-Specific Components
  - US-Specific Components
  - Other Stakeholder Components
  - Other Aviation-Specific Weather Components (WXXM)
  - Operational ICAO Defined Aviation-Specific Weather Components (ICAO IWXXM)
  - General Purpose Weather Components (WMO METCE)
  - GML ISO 19136
  - Observations and Measurements ISO 19156
  - ISO 19103, 19107, 19108, 19115, 19123, ...
  - XML
  - UML

- Low (years)

Standards Governance Body

- Individual Organizations
- EUROCONTROL (SJU), FAA, and others
- International Civil Aviation Organization (ICAO)
- World Meteorological Organization (WMO)
- ISO / OGC
- W3C / OMG

Descriptions of US and International weather data models are available at [https://wiki.ucar.edu/display/CSSWX/Weather+Data+Models](https://wiki.ucar.edu/display/CSSWX/Weather+Data+Models)
IWXXM Regulation

ICAO Responsibility
Aviation regulation and requirements

WMO Responsibility
Weather regulation and technical implementation
Wx Standards Correlation

ICAO Annex 3 / WMO No. 49 products:
- METAR/SPECI
- TAF
- SIGMET

US Specializations of ICAO Annex 3 products:
- US METAR/SPECI
- US TAF
- US SIGMET

Next-generation aviation weather products:
- Contours
- Aircraft reports
- Gust front
- Motion vector

Next-generation products will feed into IWXXM over time
IWXXM and WXXM

**IWXXM 1.0 released September 2013**

- Strict and complete representation of ICAO Annex 3 products – METAR, SPECI, TAF, SIGMET (regulated products)
- Business rules strongly enforced
- Managed by ICAO and WMO
- Updated on roughly the same time scale as ICAO Annex 3 (currently 3 years)

**WXXM 2.0 released March 2015**

- Next-generation aviation and weather data representations
- General purpose, reusable data types (aerial report, profile, trajectory, area forecast, point forecast, etc.)
- Open/extensible content policy
- Many products and data types beyond ICAO Annex 3
- Managed by Eurocontrol, FAA, and other partners
- Updated roughly every year
Next Releases-Timeline

IWXXM 2.0 release around September 2016

- Specific work items to be discussed shortly by WMO TT-AvXML, such as:
  - Additional ICAO Annex 3 products (notionally VA Advisory, TC Advisory)
  - Incorporate fixes
  - Direct utilization of AIXM representations
  - Address feedback gathered from IWXXM 1.0

WXXM 2.1 release as needed

- No specific timeline at present, but typically minor releases (2.x) are performed on an annual basis
- Released as bug fixes or new products are required

WXXM 3.0 release as needed

- No specific timeline at present, but typically major releases are performed every 2-3 years
2. GENERAL CRITERIA RELATED TO METEOROLOGICAL REPORTS

2.1 Format of meteorological reports

2.1.3 Recommendation.— METAR and SPECI should be disseminated, under bilateral agreements between States in a position to do so, in the WMO BUFR code digital form, in addition to the dissemination of the METAR and SPECI in accordance with 2.1.2.

Note.— The BUFR code form is contained in WMO Publication No. 306, Manual on Codes, Volume 1: Part B — Binary Codes.

2.1.4 METAR and SPECI if disseminated in digital form shall be formatted in accordance with a globally interoperable information exchange model and shall use extensible markup language (XML) / geography markup language (GML).

2.1.5 METAR and SPECI if disseminated in digital form shall be accompanied by the appropriate metadata.

ICAO Meteorology Panel

• New Meteorology Panel (MET/P)
  – Resulted from recommendations of the 2014 MET Divisional meeting

• Four MET/P Working Groups
  – IWXXM and SWIM implementation under the Working Group for Meteorological Information Exchange (WG-MIE)

• Key Tasks:
  – 2016 - AMHS Transition: Develop test objectives and criteria for validating AMHS capability to support IWXXM compliant data exchange
    Note: Global testing will be managed by the ICAO Comm Panel; State Bi-Lateral testing may also be pursued
  – 2018 – Annex 3: Expand IWXXM exchange for additional required products
  – 2022 – Annex 3 & PANS-MET: Introduce the meteorological component of SWIM, i.e. move toward WCS/WFS/WMS
FAA NextGen Wx Systems

• NextGen weather systems are being fielded to support FAA ATM and evolving NextGen capabilities
  – Weather products generated in OGC format
  – SOA Web Services publishing weather information

• Contracts have been awarded for:
  – NextGen Weather Processor (NWP)
    • Raytheon
  – Common Support Services – Weather (CSS-Wx)
    • Harris Corporation
NextGen Weather Architecture

Air Transportation Information Exchange Conference - Global Information Management
NWP Program Scope

- Produces advanced aviation specific weather products
- Translates weather information into weather avoidance areas for integration into decision support tools
- Enables decommissioning of legacy weather processor systems (e.g., WARP, ITWS, CIWS)
CSS-Wx Program Scope

• Provides a single source for FAA weather information and establishes enterprise level common support services using SWIM
• Provides users with the right information at the right time
• Consistent with global standards (e.g., WXXM)
• Enables decommissioning of legacy weather dissemination systems (e.g., WARP WINS, FBWTG, CDDS)
NextGen Weather Roadmap

<table>
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Legacy Wx Dissemination: WMSCR, ADAS
Current Wx Dissemination: WARP WINS & FBWTG, CDDS
CSS-Wx Work Package 1
CSS-Wx Work Package 2
NWP Work Package 1
NWP Work Package 2
NWP Work Package 3
CSS-Wx Data Access Services

- Ingests weather sensor and processor data as well as other NOAA data (e.g. Satellite, models) for FAA
- Makes weather data available through Web Services
- Adheres to international standards for handling and representing geospatial data

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<th>Web Coverage Service</th>
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<th>Web Map Service</th>
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<tbody>
<tr>
<td>Filters and transforms large gridded datasets</td>
<td>Filters and transforms non-gridded datasets</td>
<td>Renders weather data as single large image or sets of tiled images for display</td>
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<tr>
<td>NetCDF format</td>
<td>WXXM 2.0 XML format</td>
<td>JPEG, PNG, GIF, KML format</td>
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CSS-Wx WXXM Usage

Data Provider → Ingest → Transform to WXXM → Store → Retrieve

CSS-Wx

Subscription

Data Consumer

Request/reply

WFS

WCS

WMS
NWP WXXM Products

NWP Non-Gridded Analysis Products
- Precipitation (VIL) Forecast Accuracy
- Echo Tops Forecast Accuracy
- Aggregated Lightning Flashes
- Aggregated Tornado Detections
- Storm Information Echo Tops
- Storm Information Hazard Texts
- Storm Information Leading Edges
- Storm Information Motion Vectors
- Storm Information Precipitation Cells
- Precipitation (VIL) Contours
- Echo Tops Contours
- Fronts
- Growth Trends
- Wind Profiles
- Convective WAF Mosaic Polygons
- Jet Stream
- Airport Status Summary

NWP Non-Gridded Prediction Products
- Forecast Confidence
- Precipitation (VIL) Forecast Contours
- Echo Tops Forecast Contours
- Fronts Forecast
- Convective WAF Forecast Polygons

NWP Non-Gridded Terminal Products
- Microburst TRACON Map
- ATIS Panel Message
- Gust Front TRACON Map
- Gust Front Estimated Time of Impact
- Configured Alerts
- Tornado Alert
- Airport Lightning Warning
- Storm Information Motion Vectors (ASR)
- Storm Information Leading Edges (ASR)
- Storm Information Hazard Texts (ASR)
- Runway Configuration
- AP Status
- Terminal Weather Information for Pilots
NWP Product Examples

NWP Non-Gridded Analysis Products
- Aggregated Tornado Detections
- Storm Information Echo Tops
- Storm Information Hazard Texts
- Storm Information Leading Edges
- Storm Information Motion Vectors
- Growth Trends

DAL 1889  Hail and Turbulence Encounter
August 8, 2015  01:40 - 02:12 UTC
NWP Product Examples

Analysis Products

- Growth Trends
- Lightning Mosaic
- Storm Information: Motion Vectors
- Storm Information: Leading Edges
- Storm Information: Echo Tops Tags
- Storm Information: Hazard Texts
- Jet Stream Winds
- Tornado Detections
- Terminal Winds
- Terminal Winds Profile
- Microburst TRACON Map
- Gust Front TRACON Map
- Alerts
- Ribbon Display Alerts
- TWIP
- Airport Status Summary
Operational Use

• IWXXM and WXXM are starting to be integrated into operational systems now and increasingly so in the next 2-3 years

• Utilized within the United States (FAA CSS-Wx, FAA NWP, and NOAA NextGen IT Services) and tested in operational contexts internationally (ICAO/WMO)

• In November of 2016 IWXXM will become a recommended practice for ICAO member states
Summary

- **IWXXM 1.0 & WXXM 2.0 released**
  - ICAO testing of IWXXM through collaboration between the ICAO MET and Comm Panels
  - Updates planned

- **FAA NextGen Wx Systems in solution implementation**
  - Target IOC by 2019
  - Challenge to get concurrent user system upgrades
Contact Information

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